

What is claimed is:

- 1        1. A computer-implemented method of debugging an object-oriented  
2        computer program, the method comprising:
  - 3                (a) in response to user input, setting an inheritance breakpoint that is  
4                associated with a first program entity in the object-oriented computer program  
5                in which is identified a method; and
  - 6                (b) halting execution of the object-oriented computer program during  
7                debugging in response to reaching an implementation of the method defined in  
8                a second program entity in the object-oriented computer program that is  
9                different from the first program entity.
- 1        2. The computer-implemented method of claim 1, wherein the first program  
2        entity is an interface that identifies the method, and wherein the second program entity  
3        is a class that implements the method.
- 1        3. The computer-implemented method of claim 1, wherein the first program  
2        entity is a first class that includes a second implementation of the method, wherein the  
3        second program entity is a second class that inherits from the first class, and wherein  
4        the first implementation of the method in the second class overrides the second  
5        implementation of the method in the first class.
- 1        4. The computer-implemented method of claim 3, wherein the second class is  
2        a subclass of the first class.
- 1        5. The computer-implemented method of claim 1, wherein the first program  
2        entity is an abstract class that identifies the method, and wherein the second program  
3        entity is a non-abstract class that implements the method.
- 1        6. The computer-implemented method of claim 1, wherein the inheritance  
2        breakpoint is additionally associated with the method.

1        7. The computer-implemented method of claim 6, wherein setting the  
2 inheritance breakpoint includes storing in a breakpoint data structure an entry that  
3 identifies the first program entity and the method.

1        8. The computer-implemented method of claim 1, further comprising, during  
2 loading of a class in the object-oriented computer program, identifying each  
3 implementation of the method in the class and setting a breakpoint on such  
4 implementation, wherein halting execution of the object-oriented computer program  
5 during debugging in response to reaching the implementation of the method includes  
6 reaching a breakpoint set on such implementation.

1        9. The computer-implemented method of claim 1, further comprising setting a  
2 breakpoint on each implementation of the method, wherein halting execution of the  
3 object-oriented computer program during debugging in response to reaching the  
4 implementation of the method includes reaching a breakpoint set on such  
5 implementation.

1        10. The computer-implemented method of claim 9, wherein setting a  
2 breakpoint on each implementation of the method includes setting a breakpoint on a  
3 first statement in an implementation of the method.

1        11. The computer-implemented method of claim 9, wherein setting a  
2 breakpoint on each implementation of the method includes setting a breakpoint on a  
3 method call to an implementation of the method.

1        12. The computer-implemented method of claim 1, wherein setting the  
2 inheritance breakpoint includes associating a user-specified condition with the  
3 inheritance breakpoint, and wherein halting execution of the object-oriented computer  
4 program during debugging in response to reaching the implementation of the method  
5 is performed only if the user-specified condition has been met.

1            13. A computer-implemented method of debugging an object-oriented  
2            computer program, the method comprising:

1           14. A computer-implemented method of debugging an object-oriented  
2           computer program, the method comprising:

1        15. A computer-implemented method of debugging an object-oriented  
2        computer program, the method comprising:

3                (a) receiving user input to halt program execution during debugging in  
4        response to reaching any of a plurality of implementations of a method in an  
5        object-oriented computer program; and

6                (b) thereafter setting a breakpoint for at least a subset of the plurality  
7        of implementations such that execution of the object-oriented computer  
8        program will be halted in response to reaching any of the implementations on  
9        which a breakpoint has been set.

1        16. The computer-implemented method of claim 15, wherein the user input to  
2        halt program execution includes user input to set an inheritance breakpoint on the  
3        method.

1        17. The computer-implemented method of claim 15, wherein setting the  
2        breakpoint includes, during loading of a class in the object-oriented computer  
3        program, identifying each implementation of the method in the class and setting a  
4        breakpoint on such implementation.

1       18. An apparatus, comprising:

2               (a) a memory within which is resident at least a portion of an object-  
3               oriented computer program under debug, the object-oriented computer  
4               program including a first program entity in which is identified a method, and a  
5               second program entity that is different from the first program entity, and that  
6               includes an implementation of the method; and

7               (b) program code configured to set an inheritance breakpoint that is  
8               associated with the first program entity in response to user input, and to halt  
9               execution of the object-oriented computer program during debugging in  
10               response to reaching the implementation of the method defined in the second  
11               program entity.

1       19. The apparatus of claim 18, wherein the first program entity is an interface  
2       that identifies the method, and wherein the second program entity is a class that  
3       implements the method.

1       20. The apparatus of claim 18, wherein the first program entity is a first class  
2       that includes a second implementation of the method, wherein the second program  
3       entity is a second class that inherits from the first class, and wherein the first  
4       implementation of the method in the second class overrides the second  
5       implementation of the method in the first class.

1       21. The apparatus of claim 18, wherein the first program entity is an abstract  
2       class that identifies the method, and wherein the second program entity is a non-  
3       abstract class that implements the method.

1       22. The apparatus of claim 18, wherein the inheritance breakpoint is  
2       additionally associated with the method, and wherein the program code is configured  
3       to store in a breakpoint data structure an entry that identifies the first program entity  
4       and the method.

1        23. The apparatus of claim 18, wherein the program code is further configured  
2        to set a breakpoint on each implementation of the method, and wherein the program  
3        code is configured to halt execution of the object-oriented computer program during  
4        debugging in response to reaching a breakpoint set on such implementation.

1        24. The apparatus of claim 23, wherein the program code is configured to set  
2        the breakpoint on each implementation of the method by dynamically setting a  
3        breakpoint on each implementation of the method in a class in the object-oriented  
4        computer program during loading of the class.

1        25. The apparatus of claim 18, wherein the program code is configured to  
2        associate a user-specified condition with the inheritance breakpoint, and wherein the  
3        program code is configured to halt execution of the object-oriented computer program  
4        during debugging in response to reaching the implementation of the method only if  
5        the user-specified condition has been met.

2025 RELEASE UNDER E.O. 14176

1       26. An apparatus, comprising:

2               (a) a memory within which is resident at least a portion of an object-  
3               oriented computer program under debug, the object-oriented computer  
4               program including a method and a plurality of implementations of the method;  
5               and

6               (b) program code configured to receive user input to halt program  
7               execution during debugging in response to reaching any of the plurality of  
8               implementations of the method, and to thereafter set a breakpoint for at least a  
9               subset of the plurality of implementations such that execution of the object-  
10               oriented computer program will be halted in response to reaching any of the  
11               implementations on which a breakpoint has been set.

1       27. The apparatus of claim 26, wherein the user input to halt program  
2       execution includes user input to set an inheritance breakpoint on the method, and  
3       wherein the program code is configured to set a breakpoint by, during loading of a  
4       class in the object-oriented computer program, identifying each implementation of the  
5       method in the class and setting a breakpoint on such implementation.

1 28. A program product, comprising:

2 (a) program code configured to set an inheritance breakpoint in  
3 response to user input, wherein the inheritance breakpoint is associated with a  
4 first program entity in an object-oriented computer program in which is  
5 identified a method, and to halt execution of the object-oriented computer  
6 program during debugging in response to reaching an implementation of the  
7 method defined in a second program entity in the object-oriented computer  
8 program that is different from the first program entity; and  
9 (b) a signal bearing medium bearing the program code.

1                   29. The program product of claim 28, wherein the signal bearing medium  
2 includes at least one of a transmission medium and a recordable medium.

1           30. A program product, comprising:

2           (a) program code configured to receive user input to halt program

3           execution of an object-oriented computer program during debugging in

4           response to reaching any of a plurality of implementations of a method in the

5           object-oriented computer program, and to thereafter set a breakpoint for at

6           least a subset of the plurality of implementations such that execution of the

7           object-oriented computer program will be halted in response to reaching any of

8           the implementations on which a breakpoint has been set; and

9           (b) a signal bearing medium bearing the program code.

1           2           3           4           5           6           7           8           9